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#### 8. LIFETIME

The length of an individual's life is an important factor to consider when evaluating cancer risk because the dose estimte is averaged over an individual's lifetime. Since the averaging time is found in the denominator of the dose equation, a shorter lifetime would result in a higher potential risk estimate, and conversely, a longer life expectancy would produce a lower potential risk estimate.

## 8.1. KEY STUDY ON LIFETIME

Statistical data on life expectancy are published annually by the U.S. Department of Commerce in the publication: "Statistical Abstract of the United States." The latest year for which statistics are available is 1993. Available data on life expectancies for various subpopulations born in the years 1970 to 1993 are presented in Table 8-1. Data for 1993 show that the life expectancy for an average person born in the United States in 1993 is 75.5 years (U.S. Bureau of the Census, 1995). The table shows that the overall life expectancy has averaged approximately 75 years since 1982. The average life expectancy for males in 1993 was 72.1 years, and 78.9 years for females. The data consistently show an approximate 7 years difference in life expectancy for males and females from 1970 to present. Table 8-1 also indicates that life expectancy for white males (73.0 years) is consistently longer than for Black males (64.7 years). Additionally, it indicates that life expectancy for White females (79.5 years) is longer than for Black females (73.7), a difference of almost 6 years.

### 8.2. RECOMMENDATIONS

Current data suggest that 75 years would be an appropriate value to reflect the average life expectancy and is the recommended value. If gender is a factor considered in the assessment, note that the average life expectancy value for females is higher than for males. It is recommended that the assessor use the appropriate value of 72.1 years for males or 78.9 years for females. If race is a consideration in assessing exposure for male individuals, note that the life expectancy is about 8 years longer for Whites than for Blacks. It is recommended that the assessor use the values of 73 years and 64.7 years for White males and Black males, respectively. Table 8-2 presents the confidence rating for life expectancy recommendations.

This recommended value is different than the 70 years commonly assumed in EPA risk assessments. Assessors are encouraged to use values which most accurately reflect the exposed population. When using values other than 70 years, however, the assessors should consider if the dose estimate will be used to estimate risk by combining with a dose-response relationship which was derived assuming a lifetime of 70 years. If such an inconsistency exists, the assessor should adjust the dose-response relationship by multiplying by (lifetime/70). Integrated Risk Information System (IRIS) does not use a 70 year lifetime assumption in the derivation of RfCs and RfDs, but does make this assumption in the derivation of some cancer slope factors or unit risks.

## 8.3. REFERENCES FOR CHAPTER 8

U.S. Bureau of the Census. (1995) Statistical abstracts of the United States.



|                          |      | TOTAL |      |        | WHITE |      |        | BLACK AND OTHER <sup>b</sup> |      |        | BLACK |      |        |
|--------------------------|------|-------|------|--------|-------|------|--------|------------------------------|------|--------|-------|------|--------|
| YEAR                     |      | Total | Male | Female | Total | Male | Female | Total                        | Male | Female | Total | Male | Female |
| 1970                     |      | 70.8  | 67.1 | 74.7   | 71.7  | 68.0 | 75.6   | 65.3                         | 61.3 | 69.4   | 64.1  | 60.0 | 68.3   |
| 1975                     |      | 72.6  | 68.8 | 76.6   | 73.4  | 69.5 | 77.3   | 68.0                         | 63.7 | 72.4   | 66.8  | 62.4 | 71.3   |
| 1980                     |      | 73.7  | 70.0 | 77.4   | 74.4  | 70.7 | 78.1   | 69.5                         | 65.3 | 73.6   | 68.1  | 63.8 | 72.5   |
| 1981                     |      | 74.1  | 70.4 | 77.8   | 74.8  | 71.1 | 78.4   | 70.3                         | 66.2 | 74.4   | 68.9  | 64.5 | 73.2   |
| 1982                     |      | 74.5  | 70.8 | 78.1   | 75.1  | 71.5 | 78.7   | 70.9                         | 66.8 | 74.9   | 69.4  | 65.1 | 73.6   |
| 1983                     |      | 74.6  | 71.0 | 78.1   | 75.2  | 71.6 | 78.7   | 70.9                         | 67.0 | 74.7   | 69.4  | 65.2 | 73.5   |
| 1984                     |      | 74.7  | 71.1 | 78.2   | 75.3  | 71.8 | 78.7   | 71.1                         | 67.2 | 74.9   | 69.5  | 65.3 | 73.6   |
| 1985                     |      | 74.7  | 71.1 | 78.2   | 75.3  | 71.8 | 78.7   | 71.0                         | 67.0 | 74.8   | 69.3  | 65.0 | 73.4   |
| 1986                     |      | 74.7  | 71.2 | 78.2   | 75.4  | 71.9 | 78.8   | 70.9                         | 66.8 | 74.9   | 69.1  | 64.8 | 73.4   |
| 1987                     |      | 74.9  | 71.4 | 78.3   | 75.6  | 72.1 | 78.9   | 71.0                         | 66.9 | 75.0   | 69.1  | 64.7 | 73.4   |
| 1988                     |      | 74.9  | 71.4 | 78.3   | 75.6  | 72.2 | 78.9   | 70.8                         | 66.7 | 74.8   | 68.9  | 64.4 | 73.2   |
| 1989                     |      | 75.1  | 71.7 | 78.5   | 75.9  | 72.5 | 79.2   | 70.9                         | 66.7 | 74.9   | 68.8  | 64.3 | 73.3   |
| 1990                     |      | 75.4  | 71.8 | 78.8   | 76.1  | 72.7 | 79.4   | 71.2                         | 67.0 | 75.2   | 69.1  | 64.5 | 73.6   |
| 1991                     |      | 75.5  | 71.0 | 78.9   | 76.3  | 72.9 | 79.6   | 71.5                         | 67.3 | 75.5   | 69.3  | 64.6 | 73.8   |
| 1992                     |      | 75.8  | 72.3 | 79.1   | 76.5  | 73.2 | 79.8   | 71.8                         | 67.7 | 75.7   | 69.6  | 65.0 | 73.9   |
| 1993                     |      | 75.5  | 72.1 | 78.9   | 76.3  | 73.0 | 79.5   | 71.5                         | 67.4 | 75.5   | 69.3  | 64.7 | 73.7   |
| Projections <sup>c</sup> | 1995 | 76.3  | 72.8 | 79.7   | 77.0  | 73.7 | 80.3   | 72.5                         | 68.2 | 76.8   | 70.3  | 65.8 | 74.8   |
|                          | 2000 | 76.7  | 73.2 | 80.2   | 77.6  | 74.3 | 80.9   | 72.9                         | 68.3 | 77.5   | 70.2  | 65.3 | 75.1   |
|                          | 2005 | 77.3  | 73.8 | 80.7   | 78.2  | 74.9 | 81.4   | 73.6                         | 69.1 | 78.1   | 70.7  | 65.9 | 75.5   |
|                          | 2010 | 77.9  | 74.5 | 81.3   | 78.8  | 75.6 | 81.0   | 74.3                         | 69.9 | 78.7   | 71.3  | 66.5 | 76.0   |

Excludes deaths of nonresidents of the United States

Source: Bureau of the Census, 1995.

b Racial denotations were not described in the data source.

Based on middle mortality assumptions; for details, see U.S. Bureau of the Census, Current Population Reports, Series P-25, No. 1104.



| Table 8-2. Confidence in Lifetime Expectancy Recommendations |   |        |  |  |  |  |  |  |
|--|---|--------|--|--|--|--|--|--|
| Considerations   | Rationale   | Rating |  |  |  |  |  |  |
| Study Elements   |   |        |  |  |  |  |  |  |
| Level of peer review   | Data is published and has received extensive peer review.   | High   |  |  |  |  |  |  |
| Accessibility  | The study was widely available to the public (Census data).   | High   |  |  |  |  |  |  |
| Reproducibility  | Results can be reproduced by analyzing Census data.   | High   |  |  |  |  |  |  |
| Focus on factor of interest                                  | Statistical data on life expectancy were published in this study.   | High   |  |  |  |  |  |  |
| Data pertinent to US   | The study focused on the U.S. population.   | High   |  |  |  |  |  |  |
| Primary data   | Primary data was analyzed.  | High   |  |  |  |  |  |  |
| • Currency   | The study was published in 1995 and discusses life expectancy trends from 1970 to 1993. The study has also made projections for 1995 until the year 2010. | High   |  |  |  |  |  |  |
| Adequacy of data collection period                           | The data analyzed was collected over a period of years.   | High   |  |  |  |  |  |  |
| Validity of approach   | Census data is collected and analyzed over a period of years.   | High   |  |  |  |  |  |  |
| Study size   | This study was based on U.S. Census data thus the population study size is expected to be greater than 100.   | High   |  |  |  |  |  |  |
| Representativeness of the population                         | The data is representative of the U.S. population.  | High   |  |  |  |  |  |  |
| Characterization of variability                              | Data was averaged by gender and race but only for Blacks and Whites; no other nationalities were represented within the section.                          | Medium |  |  |  |  |  |  |
| Lack of bias in study design (High rating is desirable)      | There are no apparent biases.   | High   |  |  |  |  |  |  |
| Measurement error  | Measurement error may be attributed to portions of the population that avoid or provide misleading information on census surveys.                         | Medium |  |  |  |  |  |  |
| Other Elements   |   |        |  |  |  |  |  |  |
| Number of studies  | One   | Low    |  |  |  |  |  |  |
| Agreement between researchers                                | Recommendation was based on only one study, but it is widely accepted.  | High   |  |  |  |  |  |  |
| Overall Rating   |   |        |  |  |  |  |  |  |